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California Regional Water Quality Control Board
Central Coast Region
895 Aero Vista Drive, Suite 101
San Luis Obispo, CA 93401

Dear Mr. Hernandez:

RE: REVIEW OF OLIN CORPORATION DECEMBER 6, 2006 REPORTS: (1) AREA 1 PLUME MIGRATION CONTROL FEASIBILITY STUDY, AND (2) AREA I PLUME MIGRATION CONTROL WORK PLAN

On behalf of the City of Morgan Hill (the City), WorleyParsons Komex has reviewed the following Olin Corporation (Olin) December 6, 2006 reports for the Olin property at 425 Tennant Avenue, Morgan Hill, California (the Site), submitted to the Central Coast Regional Water Quality Control Board (RWQCB), i.e, the:

(1) "Area 1 Plume Migration Control Feasibility Study" (the Area 1 FS) by GeoSyntec Consultants (GeoSyntec)), and

(2) "Area 1 Plume Migration Control Work Plan" (the Area 1 Work Plan) by GeoSyntec.

Our comments on these reports follow:

1. Comments on the Area 1 FS Report

The Area 1 FS Report addresses only the feasibility of plume migration control for the core of the perchlorate plume in groundwater south of the Site, defined by Olin as the portion of the plume with concentrations exceeding 24.5 ug/L. Feasibility of remediation for other portions of the perchlorate plume, defined by Olin as area areas B and C (6 to 11 ug/L and 11 to 24.5 ug/L, respectively) and the portion of the plume between the public health goal (PHG; 6 ug/L) and Olin's assumed background (2 ug/L; sub-PHG zone) are addressed in the Olin December 6, 2006 Report, "Llagas Subbasin Cleanup Feasibility Study – Revised" (Revised FS; MACTEC 2006a). Both reports result from a sequence of regulatory directives, particularly the March 10, 2005 RWQCB Cleanup and Abatement Order R3-2005-0014 (2005 CAO) Ordering Paragraphs E, F, G and J. Comments by WorleyParsons Komex on the Revised FS report have been previously provided to RWQCB, on January 19, 2007. The following comments relate solely to the Area 1 FS report, although some of the comments may be common to both reports.

a) There is no justification in the Area 1 FS for limiting the containment goal to concentrations greater than 24.5 ug/L. Perchlorate concentrations above background level should be actively remediated by Olin.

b) The Area 1 FS does not discuss the expected performance of the hydraulic containment system for Priority Zone A. There are no maps of expected plume concentrations over time, or predicted concentration graphs for target locations in the plume for individual aquifer zones.

c) Further to point b, above, Olin does not make any projections of the expected duration of operation for the hydraulic containment system, other than to arbitrarily assume an operational life of 30 years for the purpose of estimating operation and maintenance costs. While this may be the correct estimate, no basis is provided for this assumption.

d) The Area 1 FS does not discuss the criteria for shutting down the hydraulic containment system, or the evaluation of those criteria for shut-down. Presumably the system will be operated at least as long as concentrations above the containment goal are observed in monitoring wells, however, there is no discussion of which wells, how many, or the depths and locations of such wells. Moreover, monitoring wells may not be located where plume concentrations are highest at some time in the future. Similarly, the potential use of Olin's groundwater flow and solute transport model (MACTEC 2006a) for evaluating the location, depth and concentration of areas exceeding the containment goal, for the purposes of evaluating system shut-down, is not discussed in the Area 1 FS. Also, this model should be made available by Olin for review before any decisions are made regarding this issue.

e) The proposed extraction well location for the Shallow Aquifer, shown in Figure 5-2a does not provide complete containment of the Priority Zone A plume. The northernmost 200 feet of the off-Site plume do not appear to be in the capture zone as represented by the particle traces for well SEW-1.

f) The capture zone analysis for the extraction wells in the hydraulic containment system is not adequately documented. The time period represented by the particle traces in Figures 5-2 and 5-3 is not discussed. Similarly, the number and placement of particles for each extraction well is not documented. Downgradient particle traces for Shallow Aquifer extraction wells EW-002A and EW-001A do not terminate in proximity to the well locations shown in the figure, therefore the capture zones appear to represent other well locations, not shown in the figure.

g) Detailed scoring of remedial alternatives in Table 5-1 is generally reasonable, with the exception of Alternative 4 (Hydraulic Containment, Ex-situ Treatment by Ion Exchange, and Municipal Water Supply), Implementability, which is scored with a value of 2. The analysis for this criterion and alternative is virtually identical to that provided for Alternative 1 (Hydraulic Containment, Ex-situ Treatment by Ion Exchange and On-site recharge) which is scored with a value of 5. The sole difference in analysis between these two alternatives is given by the statement "Significant negotiations will be required with the recipient of the treated water for supply". While such negotiation for the referenced water

may have a certain level of complexity, given the increasing demand for water from the growing nearby communities, the corresponding negotiations are unlikely to be so onerous as to justify a ranking of 2 for this criterion. A value of 3 or 4 is certainly more appropriate.

h) The on-site recharge option for disposition of treated water involves the injection or recharge of treated potable groundwater into an area of the Shallow and Intermediate aquifers that will still be contaminated with perchlorate. Mixing between the clean recharge water and the ambient contaminated groundwater is inevitable, resulting in re-contamination of at least some proportion of the recharged water, thereby limiting (or perhaps eliminating) its subsequent beneficial uses. Olin has established that there is a degree of hydraulic connection between the Shallow and Intermediate aquifers (MACTEC 2006a, Appendix C, p C-11, C-12; MACTEC 2006b, p. 167), therefore there is also potential for treated water recharged to the Shallow Aquifer to migrate downward into the highly contaminated Intermediate aquifer, both on-Site and downgradient of the Site. Groundwater recharged directly into the Intermediate Aquifer will clearly become re-contaminated. Similarly, Olin has documented high concentrations of perchlorate in the A/B1 Aquitard between the Shallow and Intermediate aquifers, which represents a long-term reservoir of perchlorate mass that may also contribute to the re-contamination of recharged water (e.g.,1900 ug/L perchlorate in shallow aquitard at site CPT-OS-23; MACTEC 2006a, Appendix C, p. C-13). Any evaluation of the feasibility of the on-Site recharge option must thoroughly consider the potential for re-contamination of the recharge water. Similarly, any consideration of Treated Groundwater Recharge/Re-injection permitting by the Santa Clara Valley Water District (SCVWD) should also include an evaluation of the implications of re-contamination of the treated water. Once re-contaminated, the recharged water within Zone 1 would only have to be remediated if the concentration exceeded 24.5 ug/L, severely limiting any subsequent beneficial use of the water.

i) As shown in Figure 5-2c of the Area 1 FS, the areal extent of perchlorate above 24.5 ug/L in the Deep Aquifer along Fisher Avenue is undelineated to the northeast and south of locations MW-16 and MW-52. Delineation to the north of these locations is only provided at PZ-02, which is 3000 feet from MW-16; similarly, delineation to the east is only provided by well 09S03E35E006, which is 4000 feet east-southeast of MW-52. Consequently, there is little basis for the contouring of Deep Aquifer Priority Zone A perchlorate in Figures 2-1, 5-2c, and 5-3C, and a reasonable likelihood that Priority Zone A perchlorate extends beyond the contoured area. In comparison, the Deep Aquifer capture zone of extraction well DEW-1 only barely encloses the Deep Aquifer perchlorate plume as shown in Figures 5-2c, and 5-3C. A northeastward extension of the Deep Aquifer perchlorate plume by as little as 100 feet (beyond the area shown in figures 5-2c, and 5-3C) would not be captured by DEW-1. Further delineation of the Deep Aquifer perchlorate plume, and/or a more conservative groundwater extraction scheme (greater pumping rate or additional wells) is required to verify adequate remediation of Priority Zone A in the Deep Aquifer Zone.

j) Costs presented in Table 5.3 were not estimated in a manner consistent with guidance published by the United States Environmental Protection Agency (EPA). EPA has a published guidance document titled, "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (US EPA 2000). That document was published in July 2000 and presents EPA recommendations for cost estimates of remedial alternatives provided in feasibility study reports. The EPA states the cost estimates should provide the following:

A. Source references for quantity and unit cost information.

B. Contingency to account for possible cost overruns.

C. Basis for applied contingency.

D. Basis for period of present value analysis (e.g., time required to achieve remedial action objectives).

E. Basis for discount rate used in present value analysis (e.g., per USEPA policy).

F. Major assumptions and sources of uncertainty in the overall estimate.

G. Analysis of sensitivity of cost estimates to uncertain factors.

H. Logical and organized presentation of cost estimate summaries and detailed backup information.

The goal of providing this information is to prepare consistent, complete, and accurate cost estimates. The cost estimates presented in Table 5.3 do not provide any of the above listed information.

k) Costs presented in Table 5.3 were not estimated in a manner consistent with the aforementioned EPA guidance as it pertains to the use of a discount rate for net present value (NPV) calculations. The NPV discount rate recommended by the EPA is 7 percent, which has been adjusted to eliminate the effect of expected inflation. The Report uses an escalation rate of 3 percent and a NPV discount rate of 5 percent. As a result, the costs presents in the Report are significantly higher than the EPA would accept. For example, for Remedial Alternative 1 the Report estimates a total 30-year NPV of $20M. The cost for this alternative using EPA protocol would total $13M, a significant difference.

l) Costs presented in Table 5.3 apply higher percentages for engineering services than EPA recommends. The Report applies a total percentage to the remedial alternative capital cost of 22% for the engineering design and construction management, nearly double the 12% the EPA recommends for the services.

2. Comments on the Area 1 Work Plan

The Area 1 Work Plan is very general, with key elements not yet resolved for planning, let alone implementation. However, the work is staged in such a fashion that key decisions about the disposition of treated water, water treatment process, and flow rates/hydraulic performance should not appreciably delay implementation. The lack of details in the work plan limits the scope of comments that can be provided at this time. However, based on the information that is provided in the Area 1 Work Plan, we make the following comments:

a) There is sufficient information on geological conditions in Area 1 and planned locations of extraction wells that additional details on extraction well construction and completion should be provided. Estimated depth, and screened interval at least should be provided. Similarly, additional details on drilling method, development procedures, and proposed hydraulic testing, such as the type and duration of testing, should also be provided. Proposed plans for groundwater quality sampling during hydraulic testing should also be provided.

b) The Area 1 Workplan should clearly state that extraction well drilling and completion details, and all results of hydraulic testing and groundwater quality sampling, will be provided as part of the proposed Addendum to the Area 1 FS.

c) Permitting requirements discussed in the report are incomplete. For example, there is no mention of Department of Health Services (DHS) permitting for the public water supply alternative.

Conclusion

WorleyParsons Komex hopes this review is helpful to the RWQCB in your ongoing efforts to cleanup perchlorate released from the Olin Site. We are at available at your convenience to discuss any of the comments above. If you have any questions or need additional information please contact Mark Trudell at 714 379-1157, extension 161.

Sincerely,
WorleyParsons Komex

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Principal Hydrogeologist

Steve Winners, PE
Senior Engineer

cc: Mr. Jim Ashcraft, City of Morgan Hill
Mr. Steven Hoch, Hatch and Parent

REFERENCES

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006a. Llagas Subbasin Cleanup Feasibility Study – Revised, Olin/Standard Fusee Site,425 Tennant Avenue, Morgan Hill, California. December 6.

MACTEC 2006b. Llagas Subbasin Characterization Report, Santa Clara County, Olin/Standard Fusee, Morgan Hill, California. March 29.

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